FOREST RESEARCH NOTES

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COMPARATIVE YIELD OF LUMBER GRADES FROM THREE GRADES OF REDWOOD LOGS CLASSIFIED ON THE BASIS OF THEIR SUPERFICIAL APPEARANCE IN THE STANDING TREE 1/

Research Note No. 8 issued by this Station on March 10, 1936, gave the results of a preliminary analysis of five redwood log grades which had been prepared for a tentative classification of logs in the standing tree prior to a sawmill production study in Humboldt County. Application of lumber selling prices to the yield of each log indicated that tentative Grade II needed revision and that Grade III could be consolidated with Grade IV. Further analysis has led to the following simplified three-grade classification:

Standing-tree log grades

These specifications apply to 16-foot log lengths.

Through-knots are indicated by single branches, sound branch stubs and recently healed-over knot holes in the bark.

Sap-knots are generally indicated by clusters of small branches radiating fanwise from usually bulging bases.

A cluster of two or more small knots which can be circumscribed by a circle 1 foot or less in diameter shall be counted as 1 knot.

GRADE I. Grade I logs smaller than 30 inches in diameter shall have no through-knots or sap-knots except within 1 foot of one end. Grade I logs larger than 30 inches may have through-knots and sap-knots within 1 foot of one or both ends and 1 through-knot in the central 14-foot zone. One large sap-knot, 2 medium sap-knots, or 3 small sap-knots are permitted in the central zone in addition to 1 through-knot. If no through-knot is visible, the sap-knot allowance in the central zone may be doubled, i.e., 2 large, 4 medium, or 6 small sap-knots, or equivalent combinations, such as 1 large and 3 small, or 1 large and 2 medium sap-knots. Logs with the maximum allowance of knots should be exceptionally smooth in appearance between knots to qualify as Grade I, otherwise they should be dropped to Grade II.

1/ By M. R. Brundage and T. J. Ott, Jr., Section of Forest Products.

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GRADE II. Logs with a clear length of 12 feet, measuring either from one end or between knots at both ends, or continuously clear from end to end for 75 percent of the circumference, shall be classed as Grade II regardless of the number of knots on the 4 feet of end zone or the 25 percent of knotty circumference.

Logs with scattered through-knots not confined entirely within 4 feet of end zone or 25 percent of the circumference shall be classed as Grade II if the total number within the central 14-foot zone does not exceed 1 for each 10 inches of log diameter. Whether there should be a limit in number of sap-knots in Grade II logs cannot be determined from the data so far collected by this Station but apparently an allowance of at least twice the number specified for Grade I is permissible.

GRADE III. Logs with through-knots exceeding the limits for Grade II shall be classed as Grade III.

The average comparative yields of each green lumber grade, with no allowance for degrade and footage losses between green chain and shipment, are shown in table 1 as percentages of total green tally, #3 Common and Better, for various sizes of logs graded according to the above rules. Comparisons of green lumber tally with gross Spaulding scale and with Humboldt scale appear in the last two columns. The data have been adjusted by curving the actual lumber production from 550 study logs cut in a Humboldt County sawmill in 1935. It should be mentioned that the logs observed were free from the usual pre-logging fire damage since the study plot was not burned over between log-peeling and yarding. Additional studies of about 100 logs made in another Humboldt County mill this year are now being analyzed in conjunction with the 1935 study for the formulation of grading rules applicable to bucked logs before and after peeling. Rift crack, spiral grain, birdseye, spot rot, compression wood, and other defects which cannot be taken into account in standing-tree log grading will be included in the bucked log specifications.

Since internal defects often affect the quality of lumber produced to a greater extent than defects visible on the bark surface, it is inevitable that there will be considerable deviation above and below the curved averages in the yields from individual redwood logs classified only on the basis of surface appearance in the standing tree. From this it follows that the yields from individual trees cannot be predicted with a high degree of accuracy. Nevertheless standing-tree log grades are sufficiently dependable with respect to the prediction of average yields to make them of real value in appraising different units of timber and in determining the approximate comparative realization values obtainable from different classes of trees in the same stand.

The relation of average FOB-mill green-lumber selling value to log diameter is shown for each of the three log grades in figure 1. These curves were derived by application of rough green-lumber selling prices listed as of May 18, 1936, to the curved grade production data in table 1. Discounts for quantity shipments and freight to the Bay Region have been deducted.

Table 1.- Production of green lumber grades in percent of total green-chain tally from average redwood logs of different sizes and log grades and percent of difference between log scale and green-chain tally of #3 Common and Better lumber.

Log grades based on surface appearance in the standing tree. Mill run sound and defective logs from a study plot in Humboldt County, 1935.

Medium quality stand.

Log diam. small end	LUMBER GRADES°							Lumber Tally under(-)or over(+)	
	Selects			Common					
	Clear Heart	A Grade	B Grade	#1	#2	#3	Shop	gross°° scale	Humboldt scale
Inches	LOG GRADE I								
20	°°°2.2	9.0	18.1	19.7	21.0	29.7	°°°0.3	-26.0	+ 5.7
25	3.5	9.6	18.3	21.3	19.4	27.5	0.4	-26.0	+ 5.7
30	5.0	10.7	18.5	22.6	17.5	25.2	0.5	-26.5	+ 5.0
35	7.5	11.7	18.0	24.0	15.8	22.3	0.7	-27.3	+ 3.9
40	10.3	13.2	16.9	25.9	13.2	19.6	0.9	-28.5	+ 2.1
45	13.1	15.4	15.5	27.3	11.2	16.2	1.3	-30.0	0.0
50	16.0	17.5	13.3	28.6	10.0	13.2	1.4	-32.0	- 2.9
55	19.0	18.0	11.8	29.6	9.0	11.2	1.4	-33.1	- 4.4
60	21.5	18.0	11.0	30.7	8.5	9.0	1.3	-34.0	- 5.7
65	23.5	18.0	10.5	31.7	8.0	7.2	1.1	-34.7	- 6.7
70	25.0	17.8	10.0	32.6	7.7	6.1	0.8	-35.1	- 7.3
75	26.1	17.4	9.5	33.4	7.5	5.6	0.5	-35.5	- 7.9
80	27.2	17.0	9.3	34.0	7.5	4.7	0.3	-35.9	- 8.4
85	28.3	16.3	9.2	35.0	7.5	3.5	0.2	-36.3	- 9.0
90	29.2	15.8	9.0	35.7	7.5	2.7	0.1	-36.6	- 9.4
	LOG GRADE II								
20	1.0	3.2	13.0	13.8	19.5	49.0	0.5	-18.0	+17.1
25	1.5	4.7	13.5	15.0	17.5	45.5	2.3	-20.7	+13.3
30	2.2	7.2	14.2	15.8	15.4	41.7	3.5	-23.3	+ 9.6
35	4.0	10.2	14.8	16.2	13.5	36.6	4.7	-25.8	+ 6.0
40	7.2	13.5	15.1	16.5	11.7	31.1	4.9	-28.0	+ 2.9
45	10.0	16.3	15.4	16.8	11.0	25.5	5.0	-30.0	0.0
50	12.3	17.1	15.8	17.5	10.2	21.8	5.3	-32.0	- 2.9
55	14.0	17.5	16.0	18.8	9.7	18.3	5.7	-33.1	- 4.4
60	15.3	17.0	16.0	20.4	9.2	16.6	5.5	-34.0	- 5.7
65	16.5	16.0	16.2	22.5	9.0	14.8	5.0	-34.7	- 6.7
70	17.3	15.0	16.7	24.6	8.9	13.2	4.3	-35.1	- 7.3
75	18.0	14.0	17.2	27.2	8.8	11.6	3.2	-35.5	- 7.9
80	18.5	13.0	17.7	29.8	8.7	10.3	2.0	-35.9	- 8.4
	LOG GRADE III								
20	0.5	3.7	13.0	9.5	9.5	56.8	7.0	-13.8	+23.1
25	1.0	4.4	13.1	9.6	11.0	55.4	5.5	-18.0	+17.1
30	1.9	5.2	13.2	9.7	12.0	53.2	4.8	-21.8	+11.7
35	2.8	6.2	13.3	10.0	12.5	50.3	4.9	-25.0	+ 7.1
40	3.6	7.4	13.5	10.9	12.5	46.3	5.8	-28.1	+ 3.0
45	4.0	8.6	13.5	13.0	12.2	41.3	7.4	-30.0	0.0
50	4.5	10.3	13.5	16.2	11.5	34.8	9.2	-32.0	- 2.9
55	4.6	12.2	13.5	20.3	10.5	28.7	10.2	-33.1	- 4.4
60	4.9	14.4	13.4	23.6	9.5	23.9	10.3	-34.0	- 5.7
65	5.0	16.8	13.2	26.7	8.5	19.8	10.0	-34.7	- 6.7
70	5.0	19.4	13.0	29.3	7.5	16.8	9.0	-35.1	- 7.3

° Timbers are included with lumber grades of equivalent value.

°° Gross scale, Spaulding rule.

°°° Figures from Clear to Shop, inclusive, total 100 percent across page for each diameter class.

The curves for log grades I and II may be said to represent "tree-run" averages, but that for grade III represents only the better of the low quality logs. The "tree-run" of grade III logs would be worth less than the curved values since it would include the very rough top logs which are seldom utilized in actual practice. The majority of grade II logs which reached the mill during the study had only a few knots in excess of the limits for grade II. Another grade, No. IV, appears to be desirable for a better division of the lower quality logs. In a four-grade classification, grade III could permit, say, twice as many knots as grade II, or 1 through-knot for each 5 inches of log diameter. There would be too great a range in the selling values of grade III logs as defined above if all logs in the upper third of large trees were to be included in a study run. From the standpoint of distinguishing between profitable and unprofitable rough logs after a tree is down, a finer division of the lower grades will be very helpful.

The two study logs of lowest average selling value were a 37-inch log worth $15.26 and a 49-inch log worth $15.18 per M B.M. green-chain tally. The two of highest value were a 49-inch log worth $55.06 and a 73-inch log worth $54.05 per M B.M. green-chain tally.

Average selling values of the lumber from logs of each 10-inch diameter class, read from the curves in figure 1, are as follows:

Log grade	Log diameter, inches							
	20	30	40	50	60	70	80	90
	Dollars per M B.M. green-chain tally							
I	23.85	25.67	28.31	31.32	33.35	34.70	35.58	36.14
II	21.20	22.60	25.35	27.67	29.12	30.25	31.22	
III	20.05	20.85	21.95	23.38	24.98	26.30		

The production of each lumber grade from the study-run of each log grade as a whole is shown below:

Log grade	Diam. avg. log	Clear: Heart	A Grade	B Grade	#1 Common	#2 Common	#3 Common	Shop	Total
	Inches	Percent							
I	56	18.2	16.9	13.3	30.2	10.1	10.3	1.0	100.0
II	49	11.0	15.2	14.7	19.8	12.2	22.2	4.9	100.0
III	43	3.7	9.8	13.0	15.0	10.9	40.8	6.8	100.0

The quality of yield from redwood logs undoubtedly varies with density of stand, type of soil, local climate, exposure, and other local differences, entirely apart from its variation as related to log size and log grade. This is true of logs in the California pine and other regions where several studies have been conducted in different localities and there are no good reasons to assume that the redwood region is any exception. More studies are needed to determine the approximate extent of such variability. The data herein represent a quality of timber probably intermediate between that of the dense virgin stands found on flats and that of more open stands growing on slopes at the higher elevations.

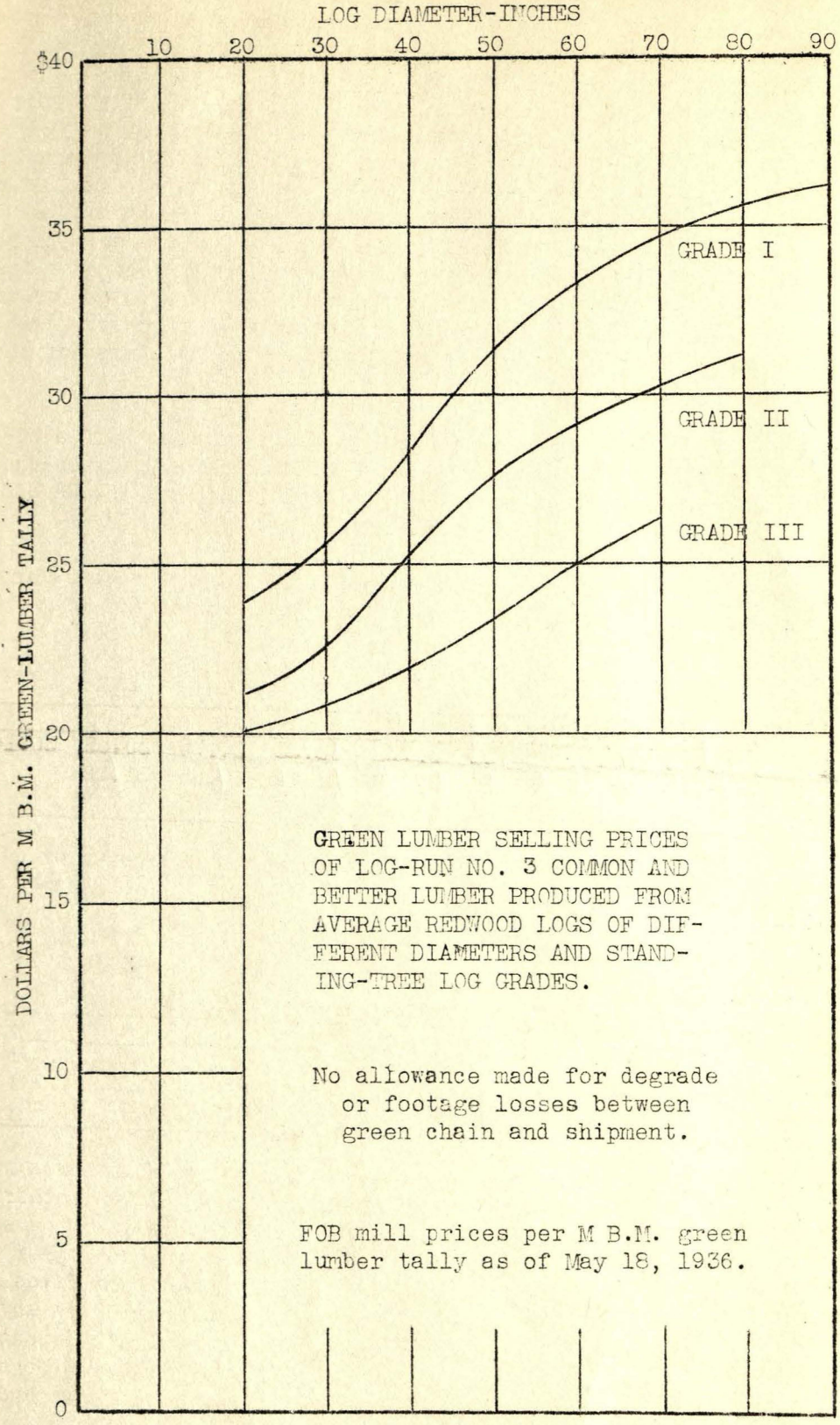

Figure 1.- Comparative selling values per M B.M. green lumber tally of various sizes and grades of redwood logs,- green-chain grade basis.